

Case study on tobacco cultivation and possible alternative crops – Kenya

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**The first meeting of the Ad Hoc Study Group on Alternative Crops established by the
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The findings, interpretations, and conclusions expressed in this report are entirely those of the authors and should not be attributed in any manner whatsoever to any of the Parties to the WHO Framework Convention for Tobacco Control, the World Health Organization or the Tobacco Free Initiative.

EXECUTIVE SUMMARY

This study was carried out for the first meeting of the ad hoc study group on alternatives crops. The study group, established by decision FCTC/COP1(17) of the Conference of the Parties to the WHO Framework Convention on Tobacco Control (WHO FCTC), seeks, among other objectives, to summarize the uptake of existing economically viable alternatives for tobacco workers, growers and, as the case may be, individual sellers (1). The study assessed the social and economic costs and benefits of tobacco cultivation vis-à-vis other commercial crops in Kenya. The approach involved the use of both primary and secondary data (literature review).

A review of the literature was done to determine the nature and structure of the tobacco industry in Kenya. This entailed collecting secondary data to document the trend in various industry variables, including acreage, number of farmers and government revenues. Primary data collection was done to enable the assessment of the competitiveness of the various enterprises so that farmers can subsequently be advised on alternative avenues for raising farm incomes. Kuria and Migori Districts in Nyanza Province were selected for the primary data collection exercise. The districts were purposively selected because they are the leading tobacco producing districts in the country, accounting for about 80% of the national output. The region also has a diverse mix of crop/livestock enterprises. Data collection focused on farmers who have either diversified or abandoned tobacco production. Farmers were asked about income, health, environment, marketing structures, access to support services (extension, agricultural credit) and other costs. The institutional arrangements that assist farmers to shift or diversify production in the region were also assessed to determine their strengths and weaknesses.

Results indicate that tobacco has the lowest returns per acre in the study area, when compared to other commercial crops, including passion fruit, water-melon, soybeans, pineapples and peppers in one production cycle. In addition, it was observed that farmers are willing to shift from tobacco cultivation, and would do so if the introduced crops have an assured market, opportunity for credit to purchase farm inputs, technical support and other favourable conditions. Farmers also indicated that they would particularly adopt commercial crops that can also be used for home consumption. The study further revealed that the institutions currently promoting the production of the alternative crops in the study area face capacity and resource constraints, which impact negatively on their operations. In addition, it was observed that those who have shifted to the production of alternative commodities have a better standard of living than those who grow tobacco.

Based on this study, the following recommendations are made:

(i) Access to agricultural credit for the production of the alternative crops should be improved. This could be achieved by opening more branches of the Agricultural Finance Corporation (AFC) in rural districts and ensuring that the AFC advances the loans to the intended beneficiaries. Another approach would be the creation of a revolving fund to assist farmers' purchases of inputs. The resulting "loans" would then be recovered after sales.

(ii) Access to agricultural information should be enhanced. The strengthening of extension services to improve the productivity of those growing alternative crops is recommended and could be done in collaboration with the institutions promoting alternative crop production in the region.

(iii) Suitable commercial crops should be identified, by region and based on soil suitability.

(iv) A sensitization program for farmers should be undertaken, in order to make them aware of the problems associated with tobacco farming and to assist them in shifting to the production of alternative crops with higher returns.

(v) Environmentally sound measures to control pests and diseases should be implemented and used effectively. This may entail the promotion of organic farming to produce the identified commodities, which will further increase farm incomes due to the premiums attached to organic products, especially in the export markets.

(vi) Existing agricultural institutions should be strengthened to effectively carry out their duties. The study suggests the establishment of additional commodity-based cooperatives to aid farmers in agricultural production and marketing. It further recommends training for institutional personnel and financial assistance (grants or soft loans) to facilitate operations. These institutions could also manage the revolving fund, identify markets for farmers and purchase inputs for farmers at a discount.

(vii) Agricultural institutions should foster effective linkages with government institutions, including the national extension institution, Kenya Agricultural Research Institute (KARI), among others. The development of such partnerships will not only enhance access to agricultural information, but may also ensure that farmers benefit from improved seed varieties and other services.

1.0 INTRODUCTION

Tobacco companies center their arguments on employment and trade benefits of tobacco for developing countries and the losses that these economies would likely incur if consumption were to be discouraged. Yet, the World Bank (2) shows that the arguments and the data on which their arguments are based misrepresent the facts. Of concern is the return to farmers, who, the tobacco industry argues, greatly benefit from its production. On the contrary, studies have revealed that this is not necessarily the case. In line with Articles 17, 20, 20.1(a), 22.1(b) and 26.3 of the WHO Framework Convention on Tobacco Control (WHO FCTC), a study group on alternative crops was established in February 2006 by a decision of the Conference of the Parties (decision FCTC/COP1(17)) (1). The study group aims, among other objectives, to analyse the issue of tobacco growing and explore possible viable alternatives. This study is in line with the outcome of that decision.

1.1 Study objectives

The general objective of this study was to prepare a Kenya case study on the socioeconomic costs and benefits of tobacco cultivation and to assess the economic viability of possible substitutes/alternative crops that could be grown instead of tobacco. The study also examined the experiences of farmers who have abandoned tobacco to produce alternative crops.

Specific objectives

- To examine the environmental costs associated with tobacco cultivation.
- To describe the health costs associated with the use of pesticides and other chemicals in tobacco cultivation.
- To assess the socioeconomic impacts of tobacco cultivation.
- To compare the profitability of tobacco cultivation with the profitability of alternative crops in Kenya.
- To assess success stories and challenges of farmers who have shifted to the production of alternative crops.
- To assess access ability to agricultural loans, extension and other farmer support services.
- To describe the existing markets and marketing structures for the targeted alternative commodities in the study area.
- To examine the existing opportunities, challenges and decisions that farmers face in making the transition from tobacco cultivation to alternative crops.
- To examine the institutional arrangements aimed at assisting tobacco farmers to shift agricultural production from tobacco growing to alternative crops.

1.2 Problem statement

Earnings from tobacco production in Kenya, which amount to about KES 20 000 per acre per annum, is not sufficient to sustain the farm families for the entire tobacco production cycle. Opondo (3) observed that increased tobacco production sought by farmers is an indication that returns from tobacco cannot meet the basic needs and therefore fail to contribute to the government program of poverty alleviation. The farmers themselves have asserted that British American Tobacco (BAT) and other tobacco companies exploit them.

This argument holds if the value of the crop is measured against other commodities with comparable area under production, such as pyrethrum and pineapples. Whereas these commodities' national acreages are in some years lower than the total agricultural land allocated to tobacco production, they record a higher value of agricultural output than tobacco as shown in Table 1.1.

Table 1.1: A comparative analysis of the value of tobacco, pineapple and pyrethrum national output from 1994–2003

Commodity		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Tobacco	Value (BKES)*	0.1	0.2	0.3	0.7	0.7	0.8	0.7	0.8	0.5	0.7
	Area	NA	NA	NA	NA	NA	14 200	13 720	12 600	13 983	14 000
Pyrethrum	Value (BKES)	0.4	0.4	0.3	0.3	0.4	0.4	0.7	0.8	1.3	0.8
	Area	16 880	11 984	9 960	11 466	6 392	7 440	12 640	17 960	17 280	10 800
Pineapples	Value (BKES)	0.4	0.5	0.6	0.6	0.9	1.1	1.1	1.2	2.3	3.5
	Area	NA	7 686	10 142	10 099	10 571	11 612	13 082	13 974	13 193	11 842

Source: Ministry of Agriculture reports, various years (4).

* Billion Kenya shillings.

In addition, government net revenues from tobacco cultivation and its other uses may be insignificant or even negative when compared to the amounts spent on treating tobacco-related diseases, and the loss of revenue incurred as a result of reduced productivity of employees who suffer from tobacco-related diseases. Some studies have estimated these costs to be enormous and to have a significant impact on the economies of developing countries. In Egypt, the direct annual cost of treating diseases caused by tobacco is estimated at US\$ 545.5 million (5). These costs are compounded by the negative environmental impacts associated with tobacco production.

In Kenya, Kuria District, which is the highest producer of tobacco, is ranked the poorest district in the country (6). The need for crop diversification or a shift to crops with higher returns cannot be overemphasized. However, the debate on the profitability of tobacco, and its socioeconomic costs vis-à-vis other viable commercial crops produced in these regions, has often taken place without credible and exhaustive data. This is the gap which this study will attempt to bridge.

2.0 STUDY METHODOLOGY

The study adopted the following approach:

i) Literature review: This entailed collecting secondary data to document various variables, including acreage, number of farmers and government revenues.

ii) Primary data collection: This was done to enable the assessment of the competitiveness of various crops which farmers could grow instead of tobacco. Kuria and Migori Districts in Nyanza Province were purposively selected for survey because they are the leading tobacco-producing districts in the country, accounting for about 80% of the national output. Farmers were asked about health and environmental issues, the profitability of tobacco production vis-à-vis other crops and how those farmers who have abandoned tobacco production have fared.

2.1 Data collection

Primary data

As indicated, data collection focused on former and current tobacco farmers. Data were also collected from farmers who had either partially or completely shifted to the production of alternative crops. The reporting unit for the survey was the person in charge of the family farm. The data that were collected included farm area devoted to the commodity in question, inputs applied (type, amount, cost), labour used (male, female, hired, family, wage rate) for each operation and machinery used (hours, cost). The total quantity of the crop harvested and the price that the farmers received for sale of his/her crop were collected. Data were then entered into spreadsheets and read into SPSS for data cleaning, organization and analysis. These data were used to conduct a profitability analysis. Views were also solicited from farmers on a variety of topics, such as perceived health risks, safety measures that they employ, market opportunities for the various commodities, access to agricultural credit and their general views on tobacco cultivation. The commodities that the study focused on include tobacco, soybean, green pepper, pineapple, passion fruit and water-melon.

Secondary data

The study used secondary information to assess the health impacts, environmental impacts and other social and economic costs and benefits resulting from tobacco cultivation. Data was collected from the relevant government ministries and institutions.

Sample Selection

Three sampling procedures were used in this study. These were: (i) purposive sampling of the districts; (ii) simple random sampling to select the locations, sub-locations and villages; and (iii) systematic sampling to select the individual farms. Here, a sampling interval of four farms was maintained after every successful interview.

The approach adopted in data collection involved personal interviews with the selected farm households using structured questionnaires. The study also used focus group discussions with a few selected tobacco farmers to validate some of the results generated from personal interviews (this was done to generate close commodity input/output coefficient estimates per acre). This approach was adopted because it has been observed that farmers sometimes give erroneous information (over- or underestimations) when interviewed individually. The study relied heavily on farmer recall, but farm records were used where available.

In total, 50 tobacco farmers were interviewed. The study however resorted to case studies for the remaining commodities because of lack of a representative sample. It should be noted that the ready market for tobacco ensures that many farmers will likely continue to produce the commodity, and that the alternative crops currently being promoted in the two districts lack a ready market. This sometimes leads to very low producer prices if there is excess supply. Thus, very few farmers have adopted these commodities. The results presented are therefore an average for the 50 interviewed tobacco farmers, while the rest of the commodities are case studies of individual farms.

2.2 Data analysis

The study used descriptive statistics (means and frequencies) for the various variables. To characterize the production systems for the selected commodities and assess their profitability, the farm production data were analysed and average quantity and cost of various inputs (such as seed, fertilizer, agrochemicals used per acre) were computed. Further, labour use (labour-days per acre) and its associated costs per acre by farm operation were computed. Labor use and cost was segregated into family labour and hired labour categories to gain a better understanding of the composition of labour and the distribution of cost.

To assess the costs and returns of the target commodities, enterprise budgeting was used for each data set as an analytical tool. The following values for revenue, costs and returns were estimated.

Revenue:

Gross income (GI), is defined as the value of the total output produced. GI was computed by multiplying average yield by average price at farm level. GI includes the output produced during the year, which may be sold, used for household consumption, used on the farm for seed, used for payments in kind or kept in store for future sale (ending stock). Non-market transactions are valued at their opportunity cost (average market price).

Costs:

Operating cost refers to the sum of input cost, traction contract cost and hired labour cost. Input cost consists of value or expenses incurred on seeds, fertilizer, insecticides, fungicides and herbicides, while the traction cost consists of the opportunity cost or the hire cost for using tractors or oxen for primary land tillage. Non-purchased inputs, such as owned seeds, were valued at their opportunity cost, that is, market price.

Opportunity cost of operating capital is the cost of capital and was computed at 14% of cash/operating cost.

Opportunity cost of family labour is the value of the family labour used, which is valued at local wage rate (this study used the average of the cost paid for hired labour by operation).

Total enterprise cost (TEC) refers to the value of all inputs used in production. It is the sum of the operating cost, the opportunity cost of equity capital and the opportunity cost of family labour. TEC is generally divided into total variable cost and total fixed cost. However, in this analysis, total fixed costs are excluded. This study focused on evaluating farm profitability on a short-term basis (in the 2006 crop season). Since fixed costs are ignored in the short term, net returns were defined as gross income per unit of activity, and expressed in Kenya shillings per acre.

Returns:

Enterprise gross margin (EGM) is defined here as the difference between GI and operating cost.

Return to family land, labour and management were computed by deducting operating cost and opportunity cost of equity capital from GI.

Return to family land, labour and management per day was computed by dividing the return to family land, labour and management by the number of family labour days used. While the standard practice is to value family labour at its opportunity cost, this assumes that wage labour opportunities exist in the community. However, this is so often not the case in most rural communities of Kenya. Thus, this measure provides an alternative estimate of profitability – i.e., the implicit daily wage a farm family earns from cultivating the various crops.

Return to family land and management is the difference between GI and TEC, which includes the opportunity cost of family labour and equity capital as part of costs. It measures the reward to the family of the farmer's management and land. An enterprise budget for the average farmer was then compared against the worst and best performers in the sample to give an indication of their income distribution. For the alternative crops, a sensitivity analysis was done to assess how sensitive their returns are given both the price and yield variability that is very common in the agricultural sector. In most cases, farmers were observed to sell their commodities at a standard price and/or to similar buyers (middlemen or processing companies, in the case of tobacco).

3.0 RESULTS AND DISCUSSION

This section describes the socioeconomic characteristics of the sample of the farmers interviewed, followed by a presentation and discussion of survey results. The results are presented by objective.

3.1 Socioeconomic characteristics of the surveyed farmers

In both districts, the mean age of sampled farmers was 39, the majority of whom (51%) did not complete primary education. The total land area under tobacco production in the 2006 crop season ranged from 0.25 acres to 3 acres, with a mean of 1 acre. Farmers also cultivate a variety crops. Some of the cash crops produced in the region in the 2006 crop season included maize, kale, cabbage, water-melon, soybean, beans, banana, passion fruit, green pepper, pineapple, coriander, finger millet, groundnuts, cassava and millet, among others. Table 3.1 shows the surveyed farmers' characteristics.

Table 3.1: Socioeconomic characteristics of the surveyed farmers

Characteristic	Range	Mode (most frequent observation)	Mean
Age of farmer (years)	20 – 70	34	39
Education of farmer	No formal education (3%)	Primary school not completed (51%)	ND
Tobacco acreage (acres)	0.2 – 3.0	1	1

3.2 Key issues in tobacco farming and alternative crops

In Kenya, the government and the tobacco companies argue that the tobacco industry contributes significantly to government revenues, both directly and indirectly, and also employs a considerable number of Kenyans, as farmers, as traders dealing in cigarette distribution and as workers in the tobacco companies. A number of concerns have been raised about the impact of tobacco cultivation on the farming families who grow the crop. Among these are the low returns from the crop leading to poverty and the enormous environmental, health and other socioeconomic costs associated with its production.

3.2.1 The environmental costs associated with tobacco cultivation

3.2.1.1 Pollution

Tobacco is a sensitive plant prone to many diseases and pests, therefore farmers use massive amounts of fertilizer to increase foliage weight and quality so as to maximize yield and returns. Huge amounts of herbicides and pesticides are also used in its production. The application of these chemicals covers the period from the nursery to when the crop is harvested. The common pesticides used include aldicarb and chlorpyrifos, which are highly toxic substances. Methyl bromide, an ozone depleting chemical, is also used to fumigate the soil prior to planting tobacco seedlings (7). In the study area, farmers reported using a variety of chemicals and fertilizers in tobacco cultivation (see Table 3.2). These chemicals leach into the soils and eventually find their way into and pollute streams, rivers and food chains, thus destroying biodiversity. Worse still, in rural Kenya, most people use water from these rivers and streams for their washing, drinking and cooking and for their animals. The agrochemicals used in the production process may also indirectly cause the genetic selection of pesticide-resistant disease transmitting agents, making control of diseases such as malaria much more difficult.

3.2.1.2 Deforestation

The process of curing gives tobacco its characteristic taste, aroma and color, and involves the cutting down of trees to provide fuel and to construct barns, which are rebuilt every two to three years. In the study area, farmers confirmed that the curing process has led to severe deforestation, apart from being very costly in terms of wood fuel prices.

3.2.1.3 Soil Degradation

Intense tobacco cultivation contributes to poor food supply and causes soil aridity. Tobacco uses more primary soil nutrients than most cash and food crops. The impact is therefore severe in tropical countries which have low soil nutrients. The majority of farmers in the study area (93%) indicated that repeated tobacco cultivation has resulted in severe soil degradation in the area. To quote one respondent: "Tobacco destroys our soils. You can not grow other crops on the same plot once you have grown tobacco on it" (Dalmas M).

Other studies have reached similar conclusions. In Melby and Pandleton (8), Mr. Samson Mwita Marwa, a former tobacco farmer indicated that Kuria District has joined the league of Arid and Semi Arid areas as an area constantly in need of famine relief. Farmers further pointed out that tobacco cultivation has introduced various stubborn weeds which were not common in the area before. One of these weeds, which is referred to as *machicha* in the local language, is proving very difficult to control.

3.2.2 Health costs associated with tobacco cultivation

As indicated above, the tobacco plant requires a substantial amount of agrochemicals to protect it from insects and diseases. As a result, farmers make numerous separate applications of agrochemicals from the time the crop is planted in the nursery to the time it is finally harvested. The intensive and repeated use of these chemicals takes a toll on tobacco farmers, many of whom are unaware of the proper safety procedures necessary to handle them. Research indicates that as a result of their occupation, tobacco farmers are exposed to green tobacco sickness, a type of nicotine poisoning caused by the absorption of nicotine through the skin. The sickness is worse and more frequent when workers do not wear gloves or protective clothing (9).

In the survey, farmers were asked if they are aware of any health risks or harmful effects associated with tobacco cultivation and also to indicate the effects. Most (82%) said they are aware of the health risks associated with tobacco farming. The effects mentioned include: chest problems/pains, especially after spraying the crop; poor eyesight, blurred vision or complete loss of sight (one farmer reported that his father who had been growing tobacco for a long time had completely lost his eyesight); miscarriages for pregnant women; fever; dry throat; itchy/irritated skin at harvesting; and back problems, especially after harvesting. Curing was also noted to produce ill effects, as during this process, farmers have to constantly monitor fire levels to prevent barns from catching fire and many sleep in the barns, turning the farmers into de facto smokers.

Farmers who indicated knowledge of the health effects associated with tobacco farming were then asked whether they take any preventive measures to avoid these effects. Results show that a very low proportion (11%) of tobacco farmers protect themselves from these harmful effects. The only protective measure mentioned by farmers was the use of protective gear when spraying agrochemicals. Farmers complained that, the high prices levied by the tobacco companies for protective materials made it difficult to acquire them, despite the known fact that high doses of herbicides and pesticides are said to be dangerous to workers, damaging eyes, skin and internal organs (10).

3.2.3 Social and economic impacts

In an effort to lower costs and increase profits, tobacco companies promote increased production of green leaf. Subsequently the companies provide both credit facilities and technical support to farmers. While the companies argue that no interest is charged on the loans, farmers on the other hand indicate that the inputs are supplied at a higher rate than the prevailing market price.

3.2.3.1 Cost of farmer support services

In the study area, a comparison of input prices, as indicated in Table 3.2, supports the farmers' arguments. As a result, a considerable proportion (45%) of the sampled farmers indicated that they were not able to fully pay the loans after deductions at the end of each crop season. This scenario ensures that farmers will always be producing tobacco each crop season to be able to offset the accrued loans. In case of failure to pay back the loans, farmers may even forfeit their assets.

Table 3.2: Comparison of input prices (company supplied and prevailing market prices) based on survey results

Input	Company price (KES)	Market price (KES)	Variance
NPK fertilizer (50 kg bag)	1895	1550	22%
CAN fertilizer (50 kg bag)	1450	1200	21%
Confidor (350 mls)	2250	2000	13%
Pyagro (300 mls)	900	700	29%
Copper sulphate (500 g)	250	180	11%
Off-Shoot-T (300 mls)	2000	1800	11%
Orthene	1000	750	33%

3.2.3.2 Child labour

Farmers therefore resort to other cost cutting measures to increase their earnings. Some of these include having underage family members assist in farm operations. The survey revealed that even though 89% of the sampled farmers think that minors should not be involved in tobacco cultivation, such labour was observed to be the case in 59% of the sampled farms¹. The use of children in tobacco cultivation on these farms presents a unique health problem. Research indicates that exposure to pesticides and other agrochemicals used in tobacco cultivation poses a considerably higher risk to children than adults, since children's nervous and immune systems can be more easily damaged, leading to a greater risk of cancer (10). The involvement of children in tobacco cultivation also leads to increased school drop-out rates. This perhaps explains the low education level (primary not completed) of most of the farmers that grow tobacco in the study area (51%).

3.2.3.3 Farm earnings from tobacco cultivation

The increase in tobacco output resulting from the promotional activities of the tobacco companies has produced a glut in the global tobacco markets. More and more farmers therefore compete with each other to sell their produce to the companies at lower and lower prices. As a result, the vast majority of tobacco growers barely break even from their sales.

Farmers also complain of the grading system used by the companies when paying them. Appendix 1 shows some of the grades used by BAT in the 2005/06 crop season. In the survey conducted for this study, farmers indicated that as a result of so many grades being used, they have no way of knowing or verifying whether the grades allocated to their produce are the right ones. In the absence of independent verification, farmers complain that the system is often abused.

¹ Formal group discussions however revealed that children are involved in tobacco production in almost all farms.

Farmers also complained of exploitation by the tobacco companies and highlighted a number of issues including: low producer prices; high input costs; non-provision of protective gear; a poor grading system; poor quality inputs; harassment when the crop fails (because of drought or hailstorms) or when the farmer cannot repay loan in full; and lack of insurance for the curing barns which often catch fire during the curing process. About 97.5% of the farmers interviewed indicated that the government should intervene on their behalf to ensure that the tobacco companies rectify the highlighted problems.

3.2.4 Profitability analysis

3.2.4.1 Patterns and cost of labour use

Tobacco is a labour-intensive crop. On average, survey results indicate that farmers use a total of 227 labourer-days per crop season (Appendix 2). This figure compares favorably with results from other studies (e.g., Assunta, (11)) which reported that tobacco cultivation requires about 1200 labour hours (about 200 labourer-days) per acre. Table 3.3 reports the mean number of labourer-days¹ and the associated cost, by type (family or hired) and operation. Because the number of farmers who reported carrying out the operations varied greatly, the means reported are the mean labourer-days and costs for those farmers who actually carried out the operations. Results indicate that the largest share of total labour is used for weeding (39.6%), followed by planting (20.0%) and tending the crop in the nursery (7%). With respect to the source of labour, farmers indicated that family labour constituted about 74% of the total labour used in tobacco production in the 2006 crop season.

Table 3.3: Labor use (average labourer-days per acre) for tobacco farming based on survey results

Operation	Labor type	Number of days	Cost per unit (KES)	Total cost (KES/acre)
Nursery management	Family ²	15	150 ³	2250
	Hired	NA	NA	NA
Land preparation	Family	9	150	1350
	Hired	NA	NA	NA
Ridging	Family	3	150	450
	Hired	NA	NA	NA
Planting	Family	16	60	960
	Hired	20	60	1200

¹ One labourer-day equals six (6) working hours in the study area.

² Family labour is valued at its opportunity cost for each farm operation.

³ This is the cost, per labourer-day, BAT paid hired workers to tend the nursery in the period the company was providing seedlings to farmers in the area.

Weeding	Family	73	60	4380
	Hired	17	60	1020
Applying fertilizers	Family	5	60	300
	Hired	NA	NA	NA
Applying agrochemicals	Family	2	60	120
	Hired	NA	NA	NA
Manual desuckering	Family	1	60	60
	Hired	1	300	300
Manual pest control	Family	10	60	600
	Hired	NA	NA	NA
Harvesting	Family	4	130	130
	Hired	9	130	1170
Preparation for curing (tying on curing sticks)	Family	NA	NA	NA
	Hired	10	180	1800
Transporting to the barn	Family	2	60	120
	Hired	3	60	180
Curing	Family	10	200	2000
	Hired	NA	NA	NA
Sorting/grading	Family	12	60	720
	Hired	NA	NA	NA
Balling	Family	2	60	120
	Hired	NA	NA	NA
Packing	Family	3	60	180
	Hired	NA	NA	NA

Total	Family	167	NA	13 740
	Hired	60	NA	5670
	Total	227	NA	19 410

3.2.4.2 Patterns and costs of inputs used

The types, quantities and the associated costs of inputs used are presented in Table 3.4.

Table 3.4: Average quantity and cost of hired/purchased input use per acre (tobacco) based on survey results

Item	Type	Units	Number of units	Unit price (KES)	Total cost (KES)
Fertilizer	NPK	50 kg bags	3	1895	5685
Agrochemicals	Confidor	350 mls	1	2250	2250
	Pyagro	300 mls	1	900	900
	Off Shoot – T	5 liters	1	2000	2000
	Copper	NA	NA	NA	75
Curing pipes ¹	NA	NA	1	NA	138.80
Sprayer ²	NA	NA	1	NA	625
Curing wood	NA	NA	1	NA	4000

Revenue

Farmers' average gross income was estimated at KES 58 452 per acre.

Costs

TEC averaged KES 38 072.10 per acre. This breaks down as input costs (41%), opportunity cost of family labour (36.1%), hired labour costs (14.9%) and opportunity cost of operating capital¹ (14%). The operating costs, excluding the opportunity cost of operating capital and family labour, averaged KES 21 413.80

¹ Farmers indicated that the average useful life of the curing pipes is 4 years. The cost per year was then calculated by dividing the total cost by 4.

² The total cost of sprayers (2500/=) was divided by 4 years, its average useful life.

3.2.4.3 Comparison of revenues between the lowest, average and highest performers

In the study area, yield and commodity grades varied significantly across the farms. The lowest performer in the sample was observed to make a great loss, and made a loss of KES -45.40 per labour day as indicated in Table 3.5.

Table 3.5: Farm performance comparison for tobacco farmers based on survey results

Item	Worst-performing farmer (KES/acre)	Average farmer (KES/acre)	Best-performing farmer (KES/acre)
Gross income	16 756	58 462	116 650
Costs			
Input cost	15 673.80	15 673.80	15 673.80
Cost of equipment	0.0	0.0	0.0
Cost of hired labour	5670.00	5670.00	5670.00
Total operating cost	21 343.80	21 343.80	21 343.80
Opportunity cost of operating capital	2 988.10	2 988.10	2 988.10
Family Labor			
Number of family labour days	176	176	176
Total family labour cost	13 740.00	13 740.00	13 740.00
Total enterprise cost	38 072.10	38 072.10	38 072.10
Profitability measures			
Enterprise gross margin	-4 587.80	37 119.00	95 306.20
Return to family land, labour and management	-7 575.90	34 130.70	90 318.10
Return to family land labour and	-45.40	204.40	540.80

¹ The average bank lending rate for 2006, 14% (12) was used to calculate the opportunity cost of operating capital.

<i>management per day</i>			
<i>Return to family land and management</i>	<i>-21 316.10</i>	<i>20 379.90</i>	<i>78 577.90</i>

Geda et al. (13) estimated the poverty line in rural Kenya at KES 857.90 per month per capita for both food and non-food items. With an average household size of six observed for the study area, an average tobacco farmer's income, if spread over the nine months of a tobacco production cycle, is not sufficient for a farm family's subsistence.

3.2.4.4 Alternative crops

The profitability analysis for pineapples, passion fruit, pepper, soybeans and water-melon is presented below. This section also compares input levels between tobacco and the various crops, and the associated returns. Actual labour figures for the commodities are appended (Appendix 2). Figure 3.1 presents a summary comparison of labour requirements for the studied commodities. In addition, this section presents a comparison of costs of production and the returns per acre between tobacco and the alternative crops. Table 3.6 provides a breakdown of input costs for selected commodities.

Figure 3.1: Labor requirements per acre by commodity based on survey results

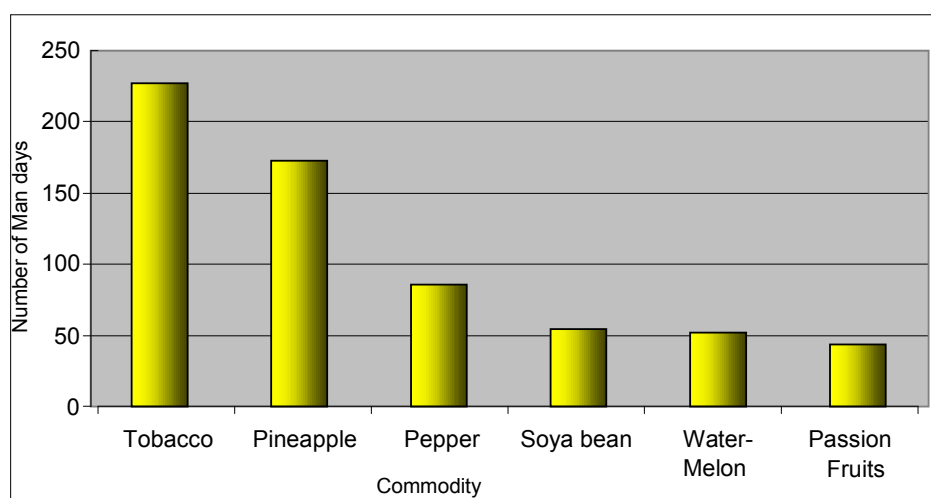


Table 3.6: Average costs for selected commodities (KES/acre) based on survey results

Item	Passion fruit ¹	Pineapple ²	Soybean	Water-melon	Pepper ¹
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¹ Costs of seeds, posts, nails and wire rolls were divided by 3 to estimate the yearly costs. The interviewed farmer indicated that the crop has lasted for three years.

² The interviewed farmer indicated that he projects to harvest the crop for up to five years. Seed cost was therefore divided by 5 to get the yearly cost

Seeds	208	1200	140	450	139
Fertilizer	0	0	0	1700	0
Agrochemicals	2650	0	0	1100	0
Posts	1667.50	0	0	0	0
Wire rolls	2,500	0	0	0	0
Nails	167.5	0	0	0	0
Traction contract	0	0	0	4800	0
Total input cost	7193	1200	140	8050	139

From the analysis, it is evident that tobacco has the least returns of all the studied crops per month of the crop season (Table 3.7). This therefore confirms the assertion that the contribution of tobacco to the farm family's income is not the best and could be a contributing factor to the widespread poverty observed in the tobacco growing regions. This call for the introduction of alternative crops to enhance farm incomes in these regions, however such a shift requires substantial support in terms of inputs, technical support and commodity marketing, among other provisions, to ensure sustainability. (Profitability comparisons between tobacco and the selected crops are illustrated by Figures 3.2 and 3.3.)Table 3.7 shows the summary of the actual figures for returns by commodity.

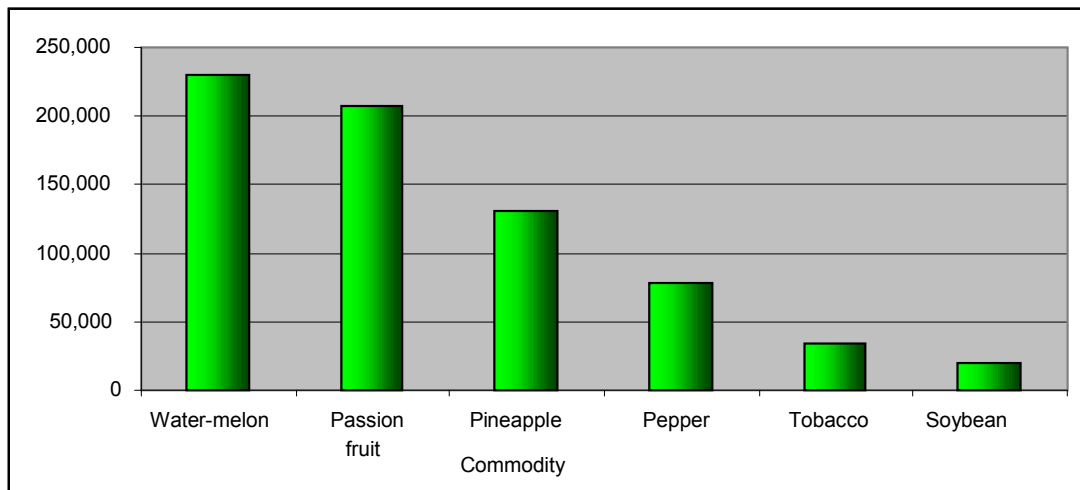
Table 3.7: Average costs and returns for selected commodities based on survey results

Item (KES/acre)	Tobacco	Passion fruit	Pineapple	Soybean	Water-melon	Pepper
Gross income	58 462	216 000	132 000	20 000	240 000	83 333
Costs						
Input cost	15 673.80	7 193	1 200	140	3 250	139
Cost of equipment	0.0	0	0	0	4 800	0
Cost of hired labour	5 670.00	500			0	4 900

¹The interviewed farmer indicated that a pepper crop can be harvested for at least three years. Establishment costs have therefore been divided by 3.

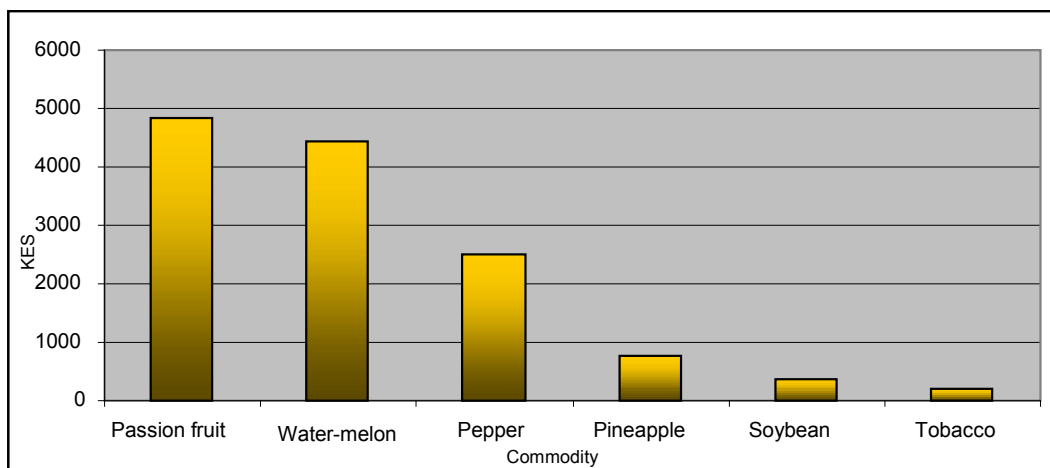
<i>Total operating cost</i>	<i>21 343.80</i>	<i>7 693</i>	<i>1 200</i>	<i>140</i>	<i>8 050</i>	<i>5 039</i>
<i>Opportunity cost of operating capital</i>	<i>2 988.10</i>	<i>1 077</i>	<i>168</i>	<i>19.60</i>	<i>1 127</i>	<i>705.50</i>
Family labour						
Number of family labour days	176	43	173	54	52	31
<i>Total family labour cost</i>	<i>13 740.00</i>	<i>6 450</i>	<i>17 300</i>	<i>5 400</i>	<i>5 200</i>	<i>3 250</i>
<i>Total enterprise cost</i>	<i>38 072.10</i>	<i>15 220</i>	<i>18 668</i>	<i>5 559.60</i>	<i>14 377</i>	<i>8 994.50</i>
Profitability measures						
<i>Enterprise gross margin</i>	<i>37 119.00</i>	<i>208 307</i>	<i>130 800</i>	<i>19 860</i>	<i>231 950</i>	<i>78 294</i>
<i>Return to family land, labour and management</i>	<i>34 130.70</i>	<i>207 230</i>	<i>130 632</i>	<i>19 840.40</i>	<i>230 823</i>	<i>77 588.90</i>
<i>Return to family land, labour and management per day</i>	<i>204.40</i>	<i>4 819.30</i>	<i>755.10</i>	<i>367.40</i>	<i>4 438.90</i>	<i>2 502.90</i>
<i>Return to family land and management</i>	<i>20 379.90</i>	<i>200 780</i>	<i>113 332.00</i>	<i>14 440.40</i>	<i>225 623.00</i>	<i>74 338.50</i>
<i>Returns to family land and management per month of crop season</i>	<i>2 264.40</i>	<i>16 731.70</i>	<i>9 444.30</i>	<i>4 813.50</i>	<i>56 405.80</i>	<i>6 194.90</i>

Figure 3.2: Return to family land, labour and management based on survey results



Results indicate that tobacco has higher returns per acre than soybeans. It should however be noted that tobacco cultivation takes nine months before harvesting, while soybeans take only three months until harvest. This implies that one can grow three crops of soybeans before a tobacco farmer reaps the first harvest. Figure 3.3 shows a comparison of returns to family land, labour and management per day.

Figure 3.3: Returns to family land, labour and management per day based on survey results



3.2.4.5 Sensitivity analysis

To assess how sensitive farm income is to commodity yield and price variability/fluctuations, a sensitivity analysis was carried out. The results are reported with respect of a $\pm 50\%$ change in gross margins as a result of a change in price and yield, holding operating cost constant. Results indicate positive gross margins for all the commodities at all yield and price ranges. This shows that these commodities may still be viable even

with a 50% reduction in prices and yields in the study area, if all factors are held constant. The sensitivity analysis results per commodity are presented in Appendix 3.

3.2.4.7 Success stories of farmers who have shifted to alternative commodities

It should be noted that this survey focused on farmers who are currently growing tobacco and those who used to grow tobacco and have either completely or partially abandoned tobacco cultivation. The following was observed in the field:

1. For case studies on passion fruit, peppers and pineapple, farmers interviewed have completely abandoned tobacco cultivation.
2. Water-melon and soybean case studies are from farmers who are still producing tobacco. They have been gradually reducing acreage devoted to tobacco production over time.

It was also revealed that about 43 farmers have completely abandoned tobacco production in the study area. These farmers currently grow a number of crops, and a typical farmer in this group was found to grow up to three different commercial crops. They indicated that this practice is intended to cushion them against price fluctuations common in the agriculture sector. Among the merits of alternative crops they cited were that such crops are less labour intensive, they generally have a higher income compared to tobacco, they mature early, most of the commodities are edible and decrease the risk of malnutrition, they do not expose the farmers to any health risks and some crops, such as soybeans, increase soil fertility. In general, the field team reported that these farmers are doing relatively better than their tobacco-growing counterparts. Table 3.8 gives the reported net income from the crops that these farmers produce.

Table 3.8: Average net income from alternative commodities (KES/acre) based on survey results

Crop	Net income (KES/acre)	Crop	Net income (KES/acre)
Pepper	120 000	Kale	48 000
Finger millet	136 000	Sugar-cane	50 000
Soybean	25 000	Beans	20 000
Pineapple	130 000	Passion fruit	160 000
Maize	30 000	Tomatoes	40 000

The main factors that have helped farmers switch to the production of alternative commodities include:

- (i) The immediate availability of markets, mainly for pineapple and passion fruit, generated by the establishment of Uchumi and Nakumatt supermarkets chains within the vicinity (30 km) and guaranteed by the signing of supply contracts between Migori Soybeans, Pineapples and Passion Fruits Cooperative Society Limited (MISOPA) and the two supermarkets.

- (ii) The production of alternative crops was also supported by the collaboration between MISOPA, the German Technical Corporation (GTZ) private sector enterprise support-programme, the Ministry of Planning and Economic Development, the International Fund for Agricultural Development (IFAD) and the United States Agency for International Development (USAID). The farmers who were producing pineapple and passion fruit were given free seedlings under the GTZ support programme, while those producing water-melon and peppers received support from USAID through the Horticulture Development Centre, which already has local and international market outlets. Indeed the farmers that produce water-melon and peppers were even guaranteed a European market should the products they produce meet the EurepGAP Standards in terms of quality and other requirements.
- (iii) The cancellation of tobacco farming contract agreements by the tobacco companies, especially BAT, as a way of silencing those farmers who were perceived to be trouble-makers (and who were in fact pushing for better deals) helped to push some farmers to switch to other crop production. One case in point was a cooperative society formed earlier to negotiate for better prices that was destroyed by the tobacco companies.
- (iv) The rebellion by some tobacco farmers due to what they perceived to be debt peonage, especially when their assets are attached to recover loans as a result of poor harvests due to drought or hailstones, has equally influenced a shift to alternative crop production.
- (v) The liberalization of tobacco trade removed some form of protection which tobacco growers used to enjoy and which guaranteed buyers for their crops, especially at a time when they had already dropped subsistence farming. Increased dependence on famine relief support was also a contributing factor for the switch farmers made to alternative crop production in order to restore their dignity and not to rely purely on food handouts, a system the farmers consider to be most demeaning.
- (vi) The advocacy and awareness campaigns on the harmful effects of tobacco farming by the Kenya Anti-Tobacco Growing Association (KATOGA) have contributed to the decision made by farmers to abandon tobacco production.

The field team also talked to one farmer who has completely abandoned tobacco cultivation. Her experiences are presented in Box 1.

Box 1: Farmer testimony

Four years have passed since Jane Moraa Otieno abandoned tobacco farming and started cultivating pineapple and passion fruit in Oyani, Migori District. "I have built a three bed roomed permanent house within two years, something that eluded me over the ten years I was producing tobacco" she boasts. She further states that her six children do not suffer from malnutrition since they can consume the crops, as well as sell them to buy other household items. "I am able to buy my children decent shoes and school uniforms each year besides being able to pay school fees for my two daughters in high school." With her head bowed down, she remembers how tough it was for her, and still is for tobacco farmers.

"Do you know my son.....that farmers are crying? They come from their farms exhausted, they can never enjoy life! Their hope is to grow tobacco for sale, a crop that you can not even eat, do you know how much it takes to produce the crop?"

"Have you ever thought of the farmers? What hardships they face before a tobacco crop matures? They have to plough and plant until their faces are blackened by the sun,But for some, that is the only way to survive."

Currently, she observes that even though her children help with tending the crop after school, it is not as labour intensive as tobacco. Consequently, their academic performance has improved dramatically due to regular school attendance, she says. “We are also able to afford paraffin to light our house at night and so the children can complete their homework.” This sharply contrasts with her earlier situation. “When I was still growing tobacco, the children had to have supper before sunset and sleep early because there was no paraffin in the tin lamps.” There was hardly enough time for the children to complete their homework. Finally, she concludes with a smile and states, “I am much healthier and have added weight since I abandoned tobacco cultivation. I do not suffer from the diseases that tobacco farmers experience, more so during curing.”

Interview by Ken Odhul, INRS Program Manager

It can be seen from the evidence that those who have completely abandoned tobacco farming and switched to other crops as indicated in the study are experiencing a positive change in their standard of living and have income above the poverty line, which is defined as less than a dollar a day.

3.2.5. Access to agricultural credit and other support services

The performance of the public agricultural extension service in Kenya has been a very controversial subject (14). The system has been perceived as top-down, uniform (*one-size-fits-all*) and inflexible and has been considered a major contributor of the poor performance of the agricultural sector (6). Thus, there has been a desire to reform extension into a system that is cost effective, responsive to farmers’ needs, broad-based in service delivery, participatory, accountable and sustainable.

Focus has thus shifted from the farmer visit (supply-driven) approach promoted in the past to demand-driven extension. Evidence however reveals that this approach has also not worked well for the poor small-scale farmers. Muyanga and Jayne (15) observed that relatively poorer households are further away from extension services compared to wealthier households. The poorest 20% were on average about 6 km while the wealthiest 20% were 4.8 km away from extension services. Their conclusion was that the extension agents deliberately position themselves to serve the economically well-off households.

In the study area, tobacco farmers reported receiving technical assistance from the tobacco companies’ staff, while none of those cultivating alternative crops reported receiving any technical assistance. This has negatively affected output from these crops.

Access to agricultural credit was also observed to be limited to tobacco farmers in the region. Results indicate that all (100%) interviewed tobacco farmers received credit in kind from the companies that operate in the region. None of those producing the alternative crops recorded having received credit in any kind for agricultural purposes. This explains the low usage of inputs (agrochemicals, fertilizers or certified planting materials) observed in the cultivation of the alternative crops.

In Kenya, the Agricultural Finance Cooperation (AFC), a government parastatal, was created to advance low-interest loans to farmers in the country. The AFC currently has 40 branches¹ and about 22 000 clients nationally (16). The institution however experiences a number of constraints, including insufficient funding by the government. In the last four years, the institution has received funding only once (2003/04 budget period) totaling KES 769 million (17)². It has been revealed in the past that the institution’s low interest rate policy has attracted political interference, with huge amounts of money lent to politically connected individuals. The poor small-scale farmers, who produce an estimated 74% of marketed output nationally (6)

¹ The 40 branches serve over 120 districts, translating to about one branch for 3 districts.

² During this period, there were about 12 million farmers, most of them small-scale farmers (2006, (16)).

lose out when this happens. This allocation is way below the sector requirements. This may explain the low number of clients that borrow from the bank.

Lack of credit facilities and technical support may therefore seriously hamper shift by farmers to the production of the alternative crops, because of the associated crop loss and lack of money to purchase quality inputs, which ultimately affect crop yield and income¹. This need to be addressed for the adoption of the alternative crops is to be sustainable.

3.2.6 Opportunities and challenges that farmers face while making the transition to alternative crops

All interviewed tobacco farmers (100%) indicated a willingness to shift to the production of alternative crops, with an estimated 92% of the farmers saying they would shift immediately, if the following conditions were to be met:

- The alternative crops should have a ready market (97%).
- Farmers should have access to credit (cash or in kind) on cost-recovery basis (86%).
- Farmers should have access to extension services (34%).
- Pilot demonstration plots should be established to educate farmers on how to produce the crop (11%).

3.2.7 Existing markets and marketing structures for the targeted alternative commodities

It was observed that there are no proper marketing structures for the alternative crops in the region. Farmers mainly sell at the local markets or sell to middlemen who occasionally come to purchase the commodities at the local markets. In the case of pineapples, it was reported that middlemen purchase at the farm gate during the harvesting season. Farmers indicated that the prices offered by the middlemen were low and were offered on a “take it or leave it” basis. However, the farmers stand to benefit if better marketing structures are put in place, since the demand outstrips supply.

3.2.7.1 National demand and supply status for selected alternative crops

Under this section a situational analysis of the national demand and supply status for some of the selected alternative crops that are grown in the area is undertaken. This section also highlights the country’s potential in the production of these commodities.

Horticultural sector

The tremendous performance of the horticulture sub-sector in the country presents an ideal investment opportunity for the region’s smallholder farmers. Fruit crops including bananas, water-melons, guavas and mangoes are assumed to be suitable cash crops for the region, and have been observed to perform well in a few farms.

¹ The passion fruit farmer complained of lack of technical know-how and agricultural credit. This he said had seriously affected the crop and forced him to uproot most of the crop due to disease infestation.

Soybean

Soybean and its processed products are widely utilized in the country. The current demand estimate stands at 40 000 tons, while local production is below 5000 tons (2003, (16)). The enterprise has an added advantage in that it enriches the soil and improves the soil structure. Currently, the country imports most of its requirements of the commodity and deficits are therefore quite substantial. Production in the region would bridge this gap. The market for the product derives mainly from processing plants, including those of Soy Africa, Sigma Feeds, Proctor and Allan, and Bidco Oil Refineries, among others. Recently (January 2007), Bidco announced that the current supply does not meet its demand and encouraged farmers to increase production with a promise that it would buy all that was available in the local market. These farmers could therefore produce soybeans to meet this shortfall.

Due to the high value of these crops, returns per acre significantly exceed those from tobacco. Though riskier than staple food crops and available only to farmers within close proximity to major transportation arteries, fruit and vegetable production for export remains a highly lucrative farming enterprise.

Passion fruit, water-melon and pineapple

Production for these commodities is far below the estimated national demand. While it is estimated that national output for passion fruit is below 5000 tons, demand for exports and processing requirements is 20 000 tons, with prices ranging between KES 60–120 per kilogram and likely to rise even higher.

While production of passion fruit may experience a temporary setback in Kenya because of passion fruit woodiness virus, the Kenya Agricultural Research Institute (KARI) and Ministry of Agriculture have indicated that clean planting materials are available. With good management, especially with good agricultural extension, the project area could produce good fruits for the export market. For the lower quality of crops, farmers may target local market and processing industries such as Trufoods, Piccana Industries, Premier Foods, Highlands and others. Pineapple and water-melon also have large markets nationally that have yet to be exploited. These commodities are particularly popular in the urban cities of Kenya, especially Nairobi. Farmers in the region could therefore increase their production targeting these urban markets.

3.2.8 Institutional arrangements that assist tobacco farmers to shift production to alternative crops, especially marketing

Future challenges and new directions for Kenyan agriculture

The challenges facing the agricultural sector in the country at present may be summarized as:

- Increasing or maintaining access to both local and international markets
- Redefining marketing channels
- Post-farm costs and efficiency in marketing
- Value addition to raw produce
- Financing of marketing activities.

However, farmers stand to derive maximum benefit through increased productivity and efficiency in marketing.

3.2.8.1 Marketing costs and their influence on farm-gate and consumer prices

Efficiency and cost reduction in marketing of agricultural produce is of paramount importance to the success or survival of the agricultural sector. The marketing channel adopted and external factors outside the area of influence of those involved in marketing affects the magnitude of marketing costs. One way of reducing costs and increasing farm incomes in this scenario could be by reducing these costs, and specifically transport costs. This could be achieved in the study area through the formation of marketing cooperatives, as group marketing would enable farmers to reduce costs through economies of scale (i.e., bulk purchases).

Existing institutional arrangements

KATOGA and MISOPA, which aim to assist tobacco farmers with a shift in agricultural production from tobacco growing to alternative crops in an economically and legally viable manner, work in collaboration with the Ministry of Health, the Poverty Eradication Commission and the Ministry of Planning and Economic Development to mobilize, sensitize and educate farmers on the dangers and health hazards associated with tobacco cultivation. KATOGA and MISOPA are also involved in soliciting funds and credit to enable farmers to purchase farm inputs and to establish processing plants. Such assistance can improve incomes and guarantee sustainability in the utilization of these commodities.

The weaknesses of existing institutions include:

- Lack of technical and human resource capacity
- Lack of effective networking with the relevant institutions
- Weak capacity to face the tobacco multinationals onslaught (e.g., tobacco companies bribing government operatives and/or locals to disrupt alternative crop activities in the area).

This study therefore proposes the strengthening of these organizations and/or other similar commodity-based cooperatives to facilitate the marketing of the realized produce in the study area. This arrangement has the potential to substantially increase farm incomes in the project area. This study specifically recommends the training of organization personnel and financial support to enhance their operations.

4.0 CONCLUSION AND RECOMMENDATIONS

This study compared the profitability of growing tobacco to the profitability of growing alternative crops in Kuria and Migori Districts in Kenya. The challenges that farmers face in making the transition from tobacco cultivation to alternative crops, as well as existing experiences (successes and obstacles), were also analysed.

Empirical analysis indicates that tobacco has the least returns per acre in the study area, when compared to passion fruit, water-melon, soybean, pineapple and pepper in one production cycle. In addition, it was observed that farmers are willing to shift from tobacco cultivation, and would do so if the conditions for the introduced crops included an assured market, the opportunity to obtain credit and technical support. Farmers also indicated that they would particularly adopt commercial crops that can also be used for home

consumption. The study further revealed that the institutions currently promoting the production of the alternative crops in the study area face capacity and financial constraints which impact negatively on their operations. The study recommends the following:

i) Increasing access to agricultural credit: Operating capital has been identified as one of the most pressing constraints in smallholder farming in Kenya (18). Farmers have also often indicated a reluctance to borrow money from the mainstream lending institutions (which also fear lending to the agricultural sector because of the associated crop failure risks resulting in non-payment) due to lack of collateral. In order to significantly improve farm incomes, there is a great need for an efficient agricultural credit system.

The study therefore recommends that the government develops a viable and sustainable financial system to service the agricultural sector. This could be achieved by opening more branches of the AFC, and by allocating adequate funds to the AFC and ensuring that it advances the loans to the intended beneficiaries. This may help alleviate poverty in the study area.

ii) Enhancing access to agricultural information: Extension was identified to be very minimal in the study area, especially for the alternative commercial crops. It is worth noting that the government is currently emphasizing demand-oriented extension. The study however recommends that the government should provide extension services to improve the efficiency of those growing the alternative crops. This could be done in partnership with the institutions promoting the production of the alternative crops in the region.

iii) Strengthening the existing institutions to effectively carry out their duties: In light of the observed constraints, the study suggests the establishment of commodity-specific cooperatives to aid farmers in agricultural production and marketing. It recommends the training of institutional personnel and financial assistance (grants or soft loans) to enable their smooth operations. It also recommends that these institutions foster linkages with government institutions, including the government extension agents, KARI and others. The development of such partnerships will not only enhance access to agricultural information, but may also ensure that farmers benefit from improved seed varieties among other inputs.

iv) An agenda for action: The study proposes the following as the way forward:

- Identification of alternative crops to tobacco according to climate and type of soil.
- Value addition through cottage processing industries (juice and food).
- Undertaking of a sensitization program for farmers in order to make them aware of the problems associated with tobacco farming and to assist them in the shift to the production of alternative crops with higher returns.
- Enhancing farmers' technical know-how and improving the marketing infrastructure for alternative crops. This will entail improving access to extension services and to processing machines for the produced commodities (farm-level value addition). This will ultimately increase farm incomes.
- Assisting farmers with inputs. This could be done in the first season to jump-start the production of these commodities. After a successful first harvest, these inputs could then be provided to the farmers at a cost. Alternatively, a revolving fund could be created and managed by the commodity cooperatives to supply farmers with the inputs, which could be recovered during the time of harvest.

- Effective use of environmentally sound measures to control pests and diseases. This may entail the promotion of organic farming to produce the commodities, however, this will further increase farm incomes due to the premiums attached to organic products especially in the export markets.

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Appendix 1

BAT (Kenya) approved tobacco prices – 2002/03 crop season (flue-cured tobacco)

Grade	Price (KES/kg)
LER	72.50
LUR	72.50
LUM	69.50
LEM	69.50
LEB	66.00
LUB	66.00
LED	50.00
LUD	48.00
LTR	43.00
LEG	32.00
LUG	31.00
LEK	27.00
LUK	26.00
LUN	24.50
LEN	21.50
LRS	19.00
LGE	8.00
LGN	8.00
LGU	8.00
LUS	8.00
LST	3.00

Source: Table in Opondo (3).

Appendix 2

Labour use per year/Season for selected crops (labourer-days per acre) based on survey results

Operation and labour type	Labour type	Passion fruits			Pepper			Soybeans			Pineapples			Water melon		
		Number of days	Cost per unit (KES)	Total cost (KES/acre)	Number of days	Cost per unit (KES)	Total cost (KES/acre)	Number of days	Cost per unit (KES)	Total cost (KES/acre)	Number of days	Cost per unit (KES)	Total cost (KES/acre)	Number of days	Cost per unit (KES)	Total cost (KES/acre)
Nursery management	Family	5	150	750	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land Preparation	Family	3	150	450	NA	NA	NA	6	100	600	3	100	300	NA	NA	NA
	Hired	NA	NA	NA	3	150	450	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ridging/digging Holes	Family	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Hired	-	-	500	7	50	350	NA	NA	NA	NA	NA	NA	NA	NA	NA
Planting	Family	2	150	300	2	100	200	9	100	900	3	100	300	18	100	1800
	Hired	NA	NA	NA	4	100	400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Weeding	Family	12	150	1800	13	100	1300	24	100	2400	108	100	10 800	30	100	3000
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Applying fertilizers	Family	1	150	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Applying agrochemicals	Family	2	150	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	8	100	800
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pruning	Family	6	150	900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Mulching	Family	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	100	400	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pest control	Family	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	100	1000	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Harvesting	Family	12	150	1800	13	100	1300	12	100	1200	48	100	4800	4	100	400
	Hired	NA	NA	NA	20	100	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Threshing	Family	NA	NA	NA	NA	NA	NA	3	100	300	NA	NA	NA	NA	NA	NA
	Hired	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	Family	43		6450	31		3250	54		5400	173		17,300	52		5200
	Hired	-		500	54		4900	-		0.00	0		0.0	0		0.00
	Total	43		6950	86		8150	54		5400	173		17 400	52		5200

Appendix 3

Sensitivity analysis results on commodity gross margins with changing price and yield based on survey results

i) Soybean

Price (KES/90 kg bag)		2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000
Yield (Bags/acre)	% Change	-50	-40	-30	-20	-10	0	10	20	30	40	50
2.5	-50	4860	5860	6860	7860	8860	9860	10860	11860	12860	13860	14860
3.0	-40	5860	7060	8260	9460	10660	11860	13060	14260	15460	16660	17860
3.5	-30	6860	8260	9660	11060	12460	13860	15260	16660	18060	19460	20860
4.0	-20	7860	9460	11060	12660	14260	15860	17460	19060	20660	22260	23860
4.5	-10	8860	10660	12460	14260	16060	17860	19660	21460	23260	25060	26860
5.0	0	9860	11860	13860	15860	17860	19860	21860	23860	25860	27860	29860
5.5	10	10860	13060	15260	17460	19660	21860	24060	26260	28460	30660	32860
6.0	20	11860	14260	16660	19060	21460	23860	26260	28660	31060	33460	35860
6.5	30	12860	15460	18060	20660	23260	25860	28460	31060	33660	36260	38860
7.0	40	13860	16660	19460	22260	25060	27860	30660	33460	36260	39060	41860
7.5	50	14860	17860	20860	23860	26860	29860	32860	35860	38860	41860	44860

ii) Passion fruit

Price (KES/basin)		400	480	560	640	720	800	880	960	1840	1232	1200
Yield (basins/acre)	% Change	-50	-40	-30	-20	-10	0	10	20	30	40	50
135.0	-50	46307	57107	67907	78707	89507	100307	111107	121907	240707	158627	154307
162.0	-40	57107	70067	83027	95987	108947	121907	134867	147827	290387	191891	186707
189.0	-30	67907	83027	98147	113267	128387	143507	158627	173747	340067	225155	219107
216.0	-20	78707	95987	113267	130547	147827	165107	182387	199667	389747	258419	251507
243.0	-10	89507	108947	128387	147827	167267	186707	206147	225587	439427	291683	283907
270.0	0	100307	121907	143507	165107	186707	208307	229907	251507	489107	324947	316307
297.0	10	111107	134867	158627	182387	206147	229907	253667	277427	538787	358211	348707
324.0	20	121907	147827	173747	199667	225587	251507	277427	303347	588467	391475	381107
351.0	30	132707	160787	188867	216947	245027	273107	301187	329267	638147	424739	413507
378.0	40	143507	173747	203987	234227	264467	294707	324947	355187	687827	458003	445907
405.0	50	154307	186707	219107	251507	283907	316307	348707	381107	737507	491267	478307

iii) Pepper

Price (KES/kg)		50	60	70	80	90	100	110	120	130	140	150
Yield (kg/acre)	% Change	-50	-40	-30	-20	-10	0	10	20	30	40	50
416.65	-50	15794	19960	24127	28293	32460	36626	40793	44959	49126	53292	57459
499.98	-40	19960	24960	29960	34959	39959	44959	49959	54959	59958	64958	69958
583.31	-30	24127	29960	35793	41626	47459	53292	59125	64958	70791	76624	82458
666.64	-20	28293	34959	41626	48292	54959	61625	68291	74958	81624	88291	94957
749.97	-10	32460	39959	47459	54959	62458	69958	77458	84957	92457	99957	107457
833.3	0	36626	44959	53292	61625	69958	78291	86624	94957	103290	111623	119956
916.63	10	40793	49959	59125	68291	77458	86624	95790	104957	114123	123289	132456
999.96	20	44959	54959	64958	74958	84957	94957	104957	114956	124956	134955	144955
1083.29	30	49126	59958	70791	81624	92457	103290	114123	124956	135789	146622	157455
1166.62	40	53292	64958	76624	88291	99957	111623	123289	134955	146622	158288	169954
1249.95	50	57459	69958	82458	94957	107457	119956	132456	144955	157455	169954	182454

iv) Pineapple

Price/piece		5.5	6.6	7.7	8.8	9.9	11	12.1	13.2	14.3	15.4	16.5
Yield (pieces/acre)	% Change	-50	-40	-30	-20	-10	0	10	20	30	40	50
6000	-50	31800	38400	45000	51600	58200	64800	71400	78000	84600	91200	97800
7200	-40	38400	46320	54240	62160	70080	78000	85920	93840	101760	109680	117600
8400	-30	45000	54240	63480	72720	81960	91200	100440	109680	118920	128160	137400
9600	-20	51600	62160	72720	83280	93840	104400	114960	125520	136080	146640	157200
10800	-10	58200	70080	81960	93840	105720	117600	129480	141360	153240	165120	177000
12,000	0	64800	78000	91200	104400	117600	130800	144000	157200	170400	183600	196800
13200	10	71400	85920	100440	114960	129480	144000	158520	173040	187560	202080	216600
14400	20	78000	93840	109680	125520	141360	157200	173040	188880	204720	220560	236400
15600	30	84600	101760	118920	136080	153240	170400	187560	204720	221880	239040	256200
16800	40	91200	109680	128160	146640	165120	183600	202080	220560	239040	257520	276000
18000	50	97800	117600	137400	157200	177000	196800	216600	236400	256200	276000	295800

v) Water-melon

	Price/piece	30	36	42	48	54	60	66	72	78	84	90
Yield (pieces/acre)	% Change	-50	-40	-30	-20	-10	0	10	20	30	40	50
2000	-50	51950	63950	75950	87950	99950	111950	123950	135950	147950	159950	171950
2400	-40	63950	78350	92750	107150	121550	135950	150350	164750	179150	193550	207950
2800	-30	75950	92750	109550	126350	143150	159950	176750	193550	210350	227150	243950
3200	-20	87950	107150	126350	145550	164750	183950	203150	222350	241550	260750	279950
3600	-10	99950	121550	143150	164750	186350	207950	229550	251150	272750	294350	315950
4000	0	111950	135950	159950	183950	207950	231950	255950	279950	303950	327950	351950
4400	10	123950	150350	176750	203150	229550	255950	282350	308750	335150	361550	387950
4800	20	135950	164750	193550	222350	251150	279950	308750	337550	366350	395150	423950
5200	30	147950	179150	210350	241550	272750	303950	335150	366350	397550	428750	459950
5600	40	159950	193550	227150	260750	294350	327950	361550	395150	428750	462350	495950
6000	50	171950	207950	243950	279950	315950	351950	387950	423950	459950	495950	531950